

United States Court of Appeals of the Federal Circuit

02-1569,-1576

LINEAR TECHNOLOGY CORPORATION,

Plaintiff/Counterclaimant-Appellant,

v.

IMPALA LINEAR CORPORATION,
TOYODA AUTOMATIC LOOM WORKS, LTD., and ANALOG DEVICES, INC.,

Defendants,

and

MAXIM INTEGRATED PRODUCTS, INC.,

Defendant/Counterclaim Defendant-Cross
Appellant,

and

UNITRODE CORPORATION,

Defendant,

and

RONALD VINSANT,

Counterclaim Defendant-Appellee.

Alan H. Blankenheimer, Heller Ehrman White & McAuliffe LLP, of San Diego, California, filed a combined petition for rehearing and rehearing en banc for defendant/counterclaim defendant-cross appellant, and counterclaim defendant-appellee. On the petition was Laura E. Underwood. Of counsel on the petition were Chad S. Campbell and Dan L. Bagatell, Brown & Bain, P.A., of Phoenix, Arizona.

William K. West, Jr., Howrey Simon Arnold & White, LLP, of Washington, DC, filed a response to the petition for plaintiff/counterclaimant-appellant. With him on the response was David W. Long.

William P. Atkins, Pillsbury Winthrop LLP, of McLean, Virginia, filed an amicus curiae brief for Intel Corporation. With him on the brief was Evan Finkel, of Los Angeles, California.

Appealed from: United States District Court for the Northern District of California

Judge Vaughn R. Walker

United States Court of Appeals for the Federal Circuit

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ON PETITION FOR PANEL REHEARING AND REHEARING EN BANC

ORDER

A combined petition for panel rehearing and rehearing en banc was filed by Maxim Integrated Products, (“Maxim”) and a response thereto was invited by the court and filed by Linear Technology Corporation (“Linear”). An amicus curiae brief was filed by Intel Corporation. Thereafter, these filings were referred to a merits panel that heard the appeal.

Upon consideration thereof,

IT IS ORDERED THAT:

- (1) The Petition for Panel Rehearing is granted for the limited purpose of correcting this court’s reporting of a portion of the district court’s decision.
- (2) The previous opinion of the court in this appeal, issued on June 17, 2004 and reported at

371 F.3d 1364, is withdrawn and the opinion attached to this order is substituted in its place.

(3) In all other respects, the Petition for Panel Rehearing is denied.

(4) The Petition for Rehearing En Banc is denied.

The mandate shall issue on August 24, 2004.

FOR THE COURT

Date

Jan Horbaly

Clerk

United States Court of Appeals of the Federal Circuit

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RONALD VINSANT,

Counterclaim Defendant-Appellee.

William K. West, Jr., Howrey Simon Arnold & White, LLP, of Washington, DC, argued for plaintiff/counterclaimant-appellant. With him on the brief were David W. Long, Jenny W. Chen, and Pamela S. Kane.

Alan H. Blankenheimer, Heller Ehrman White & McAuliffe LLP, of San Diego, California, argued for defendant/counterclaim defendant-cross appellant, and counterclaim defendant-appellee. On the brief were Chad S. Campbell and Dan L. Bagatell, Brown & Bain, P.A., of Phoenix, Arizona. Of counsel was Laura E. Underwood, Heller Ehrman White & McAuliffe LLP, of San Diego, California.

Appealed from: United States District Court for the Northern District of California

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REVISED OPINION ISSUED: August 17, 2004

Before NEWMAN, SCHALL, and LINN, Circuit Judges.

LINN, Circuit Judge.

A petition for panel rehearing was filed by Maxim and granted by the panel for the limited purpose of correcting this court's reporting of the district court's decision on Linear's motion for summary judgment that Vinsant was not an inventor of the '178 patent. This opinion replaces the court's original opinion in response to the petition for rehearing. The disposition of the appeal is unchanged.

Linear Technology Corporation ("Linear") appeals from a decision of the United States District Court for the Northern District of California, in Civil Action No. 98-CV-1727, granting summary

judgment of non-infringement in favor of defendant Maxim Integrated Products, Inc. (“Maxim”) with respect to Linear’s U.S. Patent No. 5,481,178 (“the ’178 patent”). Maxim conditionally cross-appeals the district court’s entry of summary judgment that Ronald Vinsant was not an inventor of the ’178 patent. Because the district court erred in construing the “circuit” and “circuitry,” “vary the duty cycle,” and “simultaneously off” claim limitations of the ’178 patent, we vacate the judgment of non-infringement and remand for further consideration. Because genuine issues of material fact have been raised concerning Maxim’s contributory infringement or inducement, we vacate the district court’s summary judgment of no contributory infringement or inducement of the current reversal method claims of the ’178 patent. Because Maxim failed to raise a genuine issue of material fact, the matter of inventorship was amenable to determination on summary judgment on the undisputed factual premises. On these premises, the district court correctly held that Vinsant was not a joint inventor of the ’178 patent.

I. BACKGROUND

This appeal relates to voltage regulators, which are designed to provide a predetermined and constant voltage output from a fluctuating input voltage source, such as a battery, to an energy consuming device, called a “load.” Voltage regulators of the “switching” type use transistors, which are turned on and off like switches, to control the electrical power supplied by a power source. ’178 patent, col. 1, ll. 20-24. Switching voltage regulators transmit power to the load in discrete current pulses. Id. at col. 1, ll. 27-28. To ensure a steady flow of current pulses, control circuitry is used to turn the transistors on and off. Id. at col. 1, ll. 31-33. Selectively turning the transistors off advantageously reduces the power dissipated in the regulator itself, yielding higher efficiencies for switching voltage regulators as compared to other regulator designs. See id. at col. 1, ll. 39-41; id. at col. 1, ll. 48-50. The ’178 patent discloses a “sleep mode” where both switching transistors are turned off to additionally reduce the power consumed by the regulator itself to further improve the regulator’s efficiency. Id. at col. 5, ll. 59-66. Also disclosed is a current reversal prevention mode where the regulator prevents the reverse flow of electrical current to forestall power from being drained from the load. Id. at col. 14, ll. 1-10.

Independent claim 1 is representative of a “sleep mode” claim of the ’178 patent, and is reproduced below with the disputed limitations highlighted:

1. A circuit for controlling a switching voltage regulator, the regulator having (1) a switch circuit coupled to receive an input voltage and including a pair of synchronously switched switching transistors and (2) an output circuit including an output terminal and an output capacitor coupled thereto for supplying current at a regulated voltage to a load, the control circuit comprising:

a first circuit for monitoring a signal from the output terminal to generate a first feedback signal;

a second circuit for generating a first control signal during a first state of circuit operation, the first control signal being responsive to the first feedback signal to vary the duty cycle of the switching transistors to maintain the output terminal at the regulated voltage; and

a third circuit for generating a second control signal during a second state of circuit operation to cause both switching transistors to be simultaneously OFF for a period of time if a sensed condition of the regulator indicates that the current supplied to the load falls below a threshold fraction of maximum rated output current for the regulator, whereby operating efficiency of the regulator at low output current levels is improved.

Id. at col. 16, ll. 34-57 (emphases added). Asserted independent claims 34, 41, 55, and 57 are also “sleep mode” claims.

Independent claim 51 is exemplary of a current reversal prevention mode claim, and is reproduced below:

51. A method for controlling a switching voltage regulator, the regulator having (1) a switch circuit coupled to receive an input voltage and including a pair of synchronously switched switching transistors and (2) an output circuit including an output terminal and an output inductor coupled thereto for supplying current at a regulated voltage to a load, the method comprising the steps of:

(a) monitoring a signal from the output terminal to generate a first feedback signal;

(b) varying the duty cycle of the switching transistors in response to the first feedback signal to maintain the output terminal at the regulated voltage during a first state of circuit operation, wherein the current to the load has a polarity; and

(c) maintaining one of said switching transistors OFF for a period of time following the first state of circuit operation to de-couple the output circuit from ground during the period of time so as to prevent the current to the load from reversing polarity.

Id. at col. 21, ll. 9-27 (emphasis added).

In 1997, Linear sued Maxim; Impala Linear Corporation (“Impala”); Toyoda Automatic Loom Works, Ltd. (“Toyoda”); Analog Devices, Inc. (“Analog”); and Unitrode Corporation (“Unitrode”), all manufacturers of switching voltage regulators, for infringement of claims 1-3, 31-35, 41, and 55-57 (the sleep mode claims) and claims 44-48 and 51-54 (the current reversal claims) of the ’178 patent. On

June 9, 1999, the district court issued a claim construction order construing all asserted claims of the '178 patent. Linear Tech. Corp. v. Impala Linear Corp., No. C-98-1727-FMS (N.D. Cal. June 9, 1999) (“Claim Construction Order”). On September 21, 2001, a different district court judge issued an order granting summary judgment of non-infringement in favor of Maxim and granting Linear’s motion for summary judgment that Vinsant was not an inventor of the '178 patent. Linear Tech. Corp. v. Impala Linear Corp., No. C-98-1727-VRW (N.D. Cal. Sep. 21, 2001) (“Summary Judgment Order”). Some of the original claim constructions in the Claim Construction Order were modified in the subsequent Summary Judgment Order. On October 26, 2001, the district court entered final judgments under Rule 54(b) concerning Unitrode, Maxim, and Vinsant and, given the interest of Analog in the claim constructions, issued an Order certifying an interlocutory appeal of the claim construction determinations under 28 U.S.C. § 1292(b).

Following the October 26, 2001 order, Linear and Analog sought leave of this court for permission to proceed with an interlocutory appeal of the district court’s claim constructions under 28 U.S.C. § 1292(b). We denied their request and also dismissed the appeals from the Rule 54(b) final judgments as to Unitrode, Maxim, and Vinsant. Linear Tech. Corp. v. Impala Linear Corp., 31 Fed. Appx. 700 (Fed. Cir. 2002).

Following dismissal by this court, Linear and Analog stipulated to dismiss Linear’s claims against Analog without prejudice, and the remaining parties sought re-entry of the Rule 54(b) judgments as to them. On July 26, 2002, the district court entered a new final judgment of non-infringement in favor of Maxim, Unitrode, and Vinsant, and certified the judgment under Rule 54(b). In the interim, Linear settled with Unitrode, and this court granted a joint motion to dismiss Unitrode’s appeal. Linear Tech. Corp. v. Impala Linear Corp., 64 Fed. Appx. 226 (Fed. Cir. 2003). This left Maxim and Vinsant as the only remaining adverse parties in this litigation.

Linear again appealed. Maxim objects to the district court’s certification of the Rule 54(b) judgments without imposing a condition barring Linear from bringing Analog back into the case at a future point. Maxim argues that Linear is likely to revive its claims against Analog once the appeal to

this court is resolved, and that this matter should be dismissed for lack of jurisdiction unless Linear commits not to rejoin Analog in the event of a remand. Further, Maxim claims that Linear's actions are potentially an evasion of our previous order dismissing the case due to improper certification under Rule 54(b), *see Linear Tech.*, 31 Fed. Appx. at 703, because this appeal is "virtually identical" to the appeal this court previously rejected. Maxim contends that the new Rule 54(b) judgments are merely an attempt to manufacture appellate jurisdiction.

Maxim's argument overlooks a critical point. Unlike the prior appeal, Analog is no longer a party to the litigation. In the prior appeal, Analog remained a party to the litigation with Linear's unresolved infringement claims pending against it, while the other defendants litigated the district court's claim constructions and summary judgments of non-infringement. *See Linear Tech.*, 31 Fed. Appx. at 702. Linear has settled with, or stipulated to the dismissal of its claims with, all of the parties except Maxim and Vinsant. Proper Rule 54(b) judgments have been entered concerning Maxim and Vinsant. Linear's claims against Analog have been dismissed without prejudice; Analog is no longer a party to this appeal; and Linear's dispute as to Analog has ended, with consequences to Linear, such as the running of the statute of limitations on damages. A dismissal without prejudice is nonetheless a final, appealable judgment. *United States v. Wallace & Tiernan Co.*, 336 U.S. 793, 795 n.1 (1949) ("That the dismissal was without prejudice to filing another suit does not make the cause unappealable, for denial of relief and dismissal of the case ended this suit so far as the District Court was concerned.").

Because Linear has now presented us with a final, appealable judgment, we have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

II. ANALYSIS

A. Standard of Review

"We review the grant of summary judgment de novo, drawing all reasonable inferences in favor of the non-moving party." *Teleflex, Inc. v. Ficoso N. Am. Corp.*, 299 F.3d 1313, 1323 (Fed. Cir. 2002) (citing *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255 (1986)). When evaluating a motion for

summary judgment, we view the record evidence through the same evidentiary standard that would prevail at trial. Eli Lilly & Co. v. Barr Labs., Inc., 251 F.3d 955, 962 (Fed. Cir. 2001). Summary judgment is only appropriate if there are no genuine issues of material fact and the movant is entitled to judgment as a matter of law. SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1116 (Fed. Cir. 1985) (en banc).

Claim construction is a question of law reviewed de novo. Ferguson Beauregard v. Mega Sys., Inc., 350 F.3d 1327, 1338 (Fed. Cir. 2003). Whether claim language should be interpreted as a means-plus-function limitation under 35 U.S.C. § 112 ¶ 6 is a question of law. Personalized Media Communications v. Int'l Trade Comm'n, 161 F.3d 696, 702 (Fed. Cir. 1998). If § 112 ¶ 6 is applicable, the determination of the corresponding structure is also a question of law. Kemco Sales, Inc. v. Control Papers Co., 208 F.3d 1352, 1360 (Fed. Cir. 2000). Infringement, whether literal or under the doctrine of equivalents, is a question of fact. Ferguson, 350 F.3d at 1338.

Inventorship is a question of law reviewed de novo, based on underlying findings of fact. See Univ. of Colo. Found., Inc. v. Am. Cyanamid Co., 342 F.3d 1298, 1304 (Fed. Cir. 2003). A party seeking correction of inventorship must provide clear and convincing evidence of inventorship. Hess v. Advanced Cardiovascular Sys., Inc., 106 F.3d 976, 979-80 (Fed. Cir. 1997).

B. Main Appeal

1. "Circuit" and "Circuitry" Limitations

The parties dispute whether the "circuit" and "circuitry" limitations in independent claims 1, 44, 55, and 57 of the '178 patent are means-plus-function limitations subject to 35 U.S.C. § 112 ¶ 6. Claim 1 is illustrative, and we reiterate the language of that claim with the relevant limitations highlighted:

1. A circuit for controlling a switching voltage regulator . . . the control circuit comprising:

a first circuit for monitoring a signal from the output terminal to generate a first feedback signal;

a second circuit for generating a first control signal during a first state of circuit operation, the first control signal being responsive to the first feedback signal to vary the duty cycle of the switching transistors to maintain the output terminal at the regulated voltage; and

a third circuit for generating a second control signal during a second state of circuit operation to cause

both switching transistors to be simultaneously OFF for a period of time if a sensed condition of the regulator indicates that the current supplied to the load falls below a threshold

'178 patent, col. 16, ll. 35-57 (emphasis added). Rejecting Linear's expert testimony that the word "circuit" used in the claim would be understood by persons of ordinary skill in the art to connote sufficient structure to perform the recited function, the district court ultimately concluded that these limitations were means-plus-function limitations subject to 35 U.S.C. § 112 ¶ 6. Claim Construction Order, slip op. at 2-3. The district court remarked that the only recitation of structure in the claim was in the preamble. Id. at 4.

Linear argues that the district court legally erred in failing to apply the presumption that § 112 ¶ 6 does not apply if the word "means" is not present in the limitation. Further, Linear contends that the district court erred in disregarding Linear's expert evidence that persons skilled in the art would understand the word "circuit" to connote the structure needed to perform the operations recited by the claim language. Maxim responds that § 112 ¶ 6 was correctly applied to these limitations because "circuit" and "circuitry" are too generic to provide sufficient structure to avoid the application of § 112 ¶ 6.

Our precedent has established that "[a] claim limitation that actually uses the word 'means' will invoke a rebuttable presumption that § 112 ¶ 6 applies. By contrast, a claim term that does not use 'means' will trigger the rebuttable presumption that § 112 ¶ 6 does not apply." CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1369 (Fed. Cir. 2002) (internal citation omitted); see also Personalized Media, 161 F.3d at 703.

Because none of the disputed limitations include the word "means," the district court legally erred by failing to apply the rebuttable presumption that § 112 ¶ 6 does not apply. The district court should have imposed on Maxim, who advocated a construction under § 112 ¶ 6, the burden of overcoming the presumption by demonstrating that the claim fails to "recite sufficiently definite structure" or recites a "function without reciting sufficient structure for performing that function." Watts v. XL Sys., Inc., 232 F.3d 877, 880 (Fed. Cir. 2000); see also Apex Inc. v. Raritan Computer, Inc., 325 F.3d 1364, 1371-72 (Fed. Cir. 2003) ("[A] claim term that does not use 'means' will trigger the

rebuttable presumption that § 112, ¶ 6 does not apply. . . . [The party alleging that § 112, ¶ 6 applies in the absence of a ‘means’ claim term] can rebut this presumption if it demonstrates that the claim term fails to recite sufficiently definite structure or else recites a function without reciting sufficient structure for performing that function.” (internal citations and quotation marks omitted); CCS Fitness, 288 F.3d at 1369. Instead, the district court placed on Linear the burden to establish that the claim recited sufficient structure. See, e.g., Claim Construction Order, slip op. at 3 (“The Court finds that [Linear’s expert] Dr. Blauschild’s definition of ‘circuit’ does not recite sufficient structure for purposes of § 112 ¶ 6.”).

“To help determine whether a claim term recites sufficient structure, we examine whether it has an understood meaning in the art.” CCS Fitness, 288 F.3d at 1369. Technical dictionaries, which are evidence of the understandings of persons of skill in the technical arts, plainly indicate that the term “circuit” connotes structure. See Tex. Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1202 (Fed. Cir. 2002) (“Dictionaries are always available to the court to aid in the task of determining meanings that would have been attributed by those of skill in the relevant art to any disputed terms used by the inventor in the claims.”). For example, The Dictionary of Computing 75 (4th ed. 1996) defines “circuit” as “the combination of a number of electrical devices and conductors that, when interconnected to form a conducting path, fulfill some desired function.” See Rudolf F. Graf, Modern Dictionary of Electronics 116 (7th ed. 1999) (defining “circuit” as “[t]he interconnection of a number of devices in one or more closed paths to perform a desired electrical or electronic function”). Thus, when the structure-connoting term “circuit” is coupled with a description of the circuit’s operation, sufficient structural meaning generally will be conveyed to persons of ordinary skill in the art, and § 112 ¶ 6 presumptively will not apply. See Apex, 325 F.3d at 1373 (“[T]he term ‘circuit’ with an appropriate identifier such as ‘interface,’ ‘programming’ and ‘logic,’ certainly identifies some structural meaning to one of ordinary skill in the art.”).

This is exemplified by the claim language in the ’178 patent. Claim 1 recites: “a first circuit for monitoring a signal from the output terminal to generate a first feedback signal.” ’178 patent, col. 16, ll. 42-43. The contextual language describes the objective of the “circuit,” “monitoring a signal from the

output terminal,” and the desired output of the “circuit,” “generat[ing] a first feedback signal.” The “second circuit” and “third circuit” limitations in claim 1 are accompanied by similar language reciting their respective objectives or operations. See id. at col. 16, ll. 44-57. That persons of ordinary skill in the art would understand the structural arrangements of circuit components from the term “circuit” coupled with the qualifying language of claim 1 was recognized by Linear’s expert witness. See Claim Construction Order, slip op. at 2-3 (quoting the declaration of Dr. Blauschild that a person of ordinary skill in the art reading the claims “would have an understanding of, and would be able to draw, structural arrangements of the circuit elements defined by the claims.”); see also Apex, 325 F.3d at 1374 (“Moreover, every use of the term [‘circuit’] in the asserted claims includes additional adjectival qualifications further identifying sufficient structure to perform the claimed functions to one of ordinary skill in the art.”).

We hold that because the term “circuit” is used in each of the disputed limitations of claims 1, 44, 55, and 57 of the ’178 patent with a recitation of the respective circuit’s operation in sufficient detail to suggest structure to persons of ordinary skill in the art, the “circuit” and “circuitry” limitations of such claims are not means-plus-function limitations subject to 35 U.S.C. § 112 ¶ 6. The district court’s holding to the contrary was an error of law.

2. PWM Circuits as Corresponding Structure to “Vary the Duty Cycle”

All asserted apparatus claims except claim 41 (claims 1-3, 31-35, 44-48, and 55-57) include limitations concerning “vary[ing] the [regulator] duty cycle” that were analyzed by the district court under § 112 ¶ 6. The parties dispute whether pulse width modulation (“PWM”) mentioned in the written description should have been considered as structure corresponding to the “vary[ing] the duty cycle” functional language of the claims in the district court’s claim construction. See B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1424 (Fed. Cir. 1997) (“[S]tructure disclosed in the specification is ‘corresponding’ structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. This duty to link or associate structure to function is the quid pro quo for the convenience of employing § 112, ¶ 6.”).

Because we have held that the “circuit” and “circuitry” limitations of independent claims 1, 44, 55, and 57 are not subject to 35 U.S.C. § 112 ¶ 6, only independent claim 34, and its dependent claim 35, have a means-plus-function limitation remaining at issue. The disputed limitation of claim 34 provides:

a second means for generating a first control signal during a first state of circuit operation, the first control signal being responsive to the voltage feedback signal to vary the duty cycle of the switching transistors to maintain the output terminal at the regulated voltage

’178 patent, col. 19, ll. 15-19 (emphases added).

The parties do not dispute that the constant off-time circuit depicted in the Figures of the ’178 patent is corresponding structure. Linear argues the district court erred in finding on summary judgment that the PWM circuit was “essentially generic” and thus was not corresponding structure for the sleep mode limitations. Linear argues that PWM circuits are not generic, but instead identify a specific class of structures, which is sufficient under § 112 ¶ 6. Maxim responds that the expression “pulse width modulation” refers to the function performed by circuits that control regulator output, but does not describe an actual circuit or structure for performing that function. It contends that passages in the ’178 patent specification discussing PWM circuits cannot be corresponding structure because they describe only function, and describe no particular structure.

The district court’s initial claim construction ruling stated that PWM circuits were corresponding structure to the “vary the duty cycle” limitation of claim 34. Claim Construction Order, slip op. at 22. On summary judgment, the district court modified its earlier ruling, stating that PWM circuits were not corresponding structure for these limitations. Summary Judgment Order, slip op. at 23-24. Relying on deposition testimony by the named inventor, Dr. Wilcox, the district court found that “the term ‘pulse-width modulator’ is essentially generic” and “does not reference a specific structure.” Id. at 24.

“The determination of the claimed function and corresponding structure of a means-plus-function claim limitation is a question of law, reviewed de novo.” ACTV Inc. v. Walt Disney Co., 346 F.3d 1082, 1087 (Fed. Cir. 2003). In construing a means-plus-function claim limitation, the recited function within that limitation must first be identified. Id. “Then, the written description must be

examined to determine the structure that corresponds to and performs that function.” Id.
“Proper application of § 112 ¶ 6 generally reads the claim element to embrace distinct and alternative described structures for performing the claimed function.” Creo Prods., Inc. v. Presstek, Inc., 305 F.3d 1337, 1346 (Fed. Cir. 2002).

The claim language states that the function of the “second means” limitation in claim 34 is to generate a first control signal to vary the duty cycle of the switching transistors to maintain the output terminal at the regulated voltage. See ’178 patent, col. 19, ll. 15-19. As the district court correctly recognized in its claim construction order, Claim Construction Order, slip op. at 22, the ’178 patent specification links the structure of PWM circuitry to the function of controlling the duty cycle of the switching transistors in the following passage:

As discussed above, the embodiments of the control circuits of the present invention shown in FIGS. 2-4 include one-shot circuit 25. In accordance with another feature of the present invention, the one-shot circuit could be replaced with other types of circuits that control the duty cycle of the power switch. For example, one-shot circuit 25 could be replaced with a pulse-width modulator circuit that provides a pulse-width modulated signal in response to a control signal. Of course, other types of circuits could be used as well.

’178 patent, col. 9, ll. 12-22 (emphasis added).

Contrary to Maxim’s argument, and the district court’s conclusion on summary judgment, PWM circuits are not excludable from the corresponding structure for failing to reference a specific structure. See Summary Judgment Order, slip op. at 24. Although the expression “PWM circuit” does not reference a specific circuit structure, persons of skill in the art would understand that “PWM circuit” references a discrete class of circuit structures that perform known functions. That the disputed term is not limited to a single structure does not disqualify it as a corresponding structure, as long as the class of structures is identifiable by a person of ordinary skill in the art. See Creo Prods., 305 F.3d at 1347 (“Under our case law interpreting § 112, ¶ 6, knowledge of one skilled in the art can be called upon to flesh out a particular structural reference in the specification for the purpose of satisfying the statutory requirement of definiteness.”). Linear cites technical textbooks and electronic parts catalogs indicating that PWM circuits are well-known circuit structures to persons of skill in the art. Thus, we conclude that the district court erred in excluding PWM circuits from the corresponding structure of the “second

means” limitation of claim 34 of the ’178 patent.

3. “Simultaneously Off”

The parties dispute whether the “simultaneously off” sleep mode limitations of claims 1-6, 31-33, 34-35, 41, and 57 of the ’178 patent were correctly construed. The relevant limitations of the independent claims of the ’178 patent provide:

(claim 1) a third circuit for generating a second control signal during a second state of circuit operation to cause both switching transistors to be simultaneously OFF for a period of time if a sensed condition of the regulator indicates that the current supplied to the load falls below a threshold fraction of maximum rated output current for the regulator, whereby operating efficiency of the regulator at low output current levels is improved.

’178 patent, col. 16, ll. 49-57 (emphasis added).

(claim 34) a third means for generating a second control signal during a second state of circuit operation to cause both switching transistors to be simultaneously OFF for a period of time if a sensed condition of the regulator indicates that the current supplied to the load falls below a threshold fraction of maximum rated output current for the regulator, the period of time having a duration which is a function of the current supplied to the load by the regulator.

Id. at col. 19, ll. 20-27 (emphasis added).

(claim 41) turning both switching transistors simultaneously OFF for a period of time during a second state of circuit operation following the first state of circuit operation, so as to allow the output capacitor to maintain the output substantially at the regulated voltage by discharging during the second state of circuit operation, the period of time beginning when the current supplied to the load falls below a threshold fraction of maximum rated output current for the regulator, and having a duration which is a function of the current supplied to the load by the regulator

Id. at col. 20, ll. 5-14 (emphasis added).

(claim 57) circuitry incorporated in the control circuit for detecting a condition in the output circuit indicative of the current supplied to the load falling below a threshold fraction of maximum rated output current for the regulator and for turning off both switching transistors simultaneously for a period of time if the supplied current falls below the threshold, the period of time having a duration which is a function of the current supplied to the load by the regulator.

Id. at col. 22, ll. 41-49 (emphasis added).

Linear argues that the district court misconstrued these limitations and erred in not giving the claim term “simultaneously off” the full range of its ordinary and customary meaning by requiring that the transistors be switched off at the same moment. Linear argues that the correct construction refers to

the action of the circuit in holding both transistors off at the same time. In support of its construction, Linear points to the following passage in the '178 patent specification:

[C]onstant current source I_1 72 and comparator 74 allow push-pull switch 15 to go into a state of operation where both MOSFETS 16 and 17 are simultaneously OFF under conditions where the output voltage V_{OUT} can be maintained substantially at the regulated voltage V_{REG} by output capacitor C_{OUT} . This state of operation is referred to herein as a “sleep mode.” The ability of push-pull switch 15 to go into such a sleep mode is in contrast to the regulator circuit of FIG. 1 where one of the two MOSFETs 16 and 17 is substantially ON at all times. This feature of the present invention reduces the regulator circuit power consumption since push-pull switch 15 does not dissipate power or allow power to be pulled from load R_L to ground in sleep mode.

'178 patent, col. 5, l. 59 – col. 6, l. 5 (emphases added). Linear argues that the plain meaning of “simultaneously” merely requires a condition existing or occurring at the same time. It thus contends that the limitation “simultaneously off” only requires both transistors to be off at the same time, regardless of when each transistor is turned off or whether one transistor is turned off before the other.

Maxim responds that these limitations are directed to the manner in which sleep mode is entered. In amending its claims to distinguish the prior art, the applicant stated “the switching transistors of applicants’ regulator are turned off if the current supplied to the load falls below a threshold level.” In describing the sleep mode claims in response to a rejection, applicant stated: “When the output current of the regulator drops below a threshold level . . . the regulator’s switching transistors are turned off simultaneously for a period of time while previously stored energy in the regulator’s output circuit supplies current to the load.”

In construing the claims, the district court relied on the definition of “simultaneous” from Webster’s Ninth New Collegiate Dictionary 1099 (1991): “existing or occurring at the same time; exactly coincident.” Claim Construction Order, slip op. at 11. The district court found this definition to suggest that an action was required. The court thus construed the term to encompass “the act of turning or causing both transistors to be off, not the state of being off, that occurs simultaneously.” Id.

The plain meaning of the word simultaneously is “in a simultaneous manner : at the same time : CONCURRENTLY.” Webster’s Third New International Dictionary 2122 (1993). The definition of

simultaneous is “existing or occurring at the same time : COINCIDENT, CONCURRENT.” *Id.* (emphasis added). Because simultaneously merely requires a condition to exist at the same time or concurrently, the district court erroneously construed the “simultaneously off” limitations too narrowly. The disputed limitation in claims 1 and 34 “to cause both switching transistors to be simultaneously OFF for a period of time” does not require the switching transistors to be turned off or disabled at the same instant, as the district court held. (emphasis added). To construe the term in that way overlooks the phrase “period of time,” which refers to a span of time more consistent with the recitation of a state of operation of the transistors rather than an act of transition between states. Thus, we conclude that the ordinary and customary meaning of “simultaneously off,” in contextual relation to the “period of time” language of the claims, encompasses the simultaneous state of both switching transistors being disabled or held off. The parallel provisions in claims 44 and 57, e.g., “turning both switching transistors simultaneously OFF for a period of time,” do not merit a different construction. The applicant did not disavow the broader meaning of “simultaneously off” in the specification or prosecution history. The passages in the prosecution history cited by Maxim are not disclaimers of claim scope meriting a narrower construction, but are instead consistent with our claim construction of “simultaneously off.”

Thus, the “simultaneously off” limitations of claim 1, 34, 44, and 57 only require that both switching transistors be held off or disabled for an overlapping period of time. The switching transistors do not need to be turned off or disabled at the same instant. The district court erred in construing the claims to the contrary.

4. Contributory Infringement or Inducement of Current Reversal Method Claims

The parties dispute whether Linear presented sufficient evidence to find direct infringement by Maxim’s customers to support its claim of contributory infringement or inducement of the current reversal method claims 51-54 of the ’178 patent by Maxim. The parties’ dispute centers around step (c) of claim 51, which states in pertinent part:

maintaining one of said switching transistors OFF for a period of time following the first state of circuit operation to de-couple the output circuit from ground during the period of time so as to prevent the current to the load from reversing polarity.

'178 patent, col. 21, ll. 24-29 (emphasis added). The district court construed this limitation as follows:

Th[e] purpose [of the current reversal protection feature] is to prevent the regulator from drawing power from the load. As far as the Court is aware, power is not drawn from the load just because the 'saw tooth' current dips below a value of zero. Rather, because the average inductor current is designed to match the output current, the relevant measure of when the regulator draws power from the load is when the average (not instantaneous) current reverses polarity.

Claim Construction Order, slip op. at 35 (second emphasis added). Linear does not appeal this construction.

On summary judgment, the district court concluded that for Maxim to infringe limitation (c) of claim 51, which requires prevention of the average inductor current from reversing polarity, Maxim's accused circuits must be used with a load capable of creating a reverse average inductor current. Summary Judgment Order, slip op. at 29. In support of its allegation of infringement, Linear submitted an expert declaration by Robert Blauschild (the "RB I" declaration) stating that Maxim's accused circuits were used in computers made by two of Maxim's customers. Id. at 31. But Blauschild's "RB I" expert declaration was excluded by the district court for failure to previously disclose expert opinions under Federal Rule of Civil Procedure 26. Id. at 32-33. Finding that this was the only evidence Linear provided in opposition to summary judgment, id. at 33, the district court granted summary judgment of non-infringement in favor of Maxim, finding that Linear could not prevail on its indirect infringement claims because it had not established that Maxim's parts were used to actually prevent reverse average inductor current, id. at 34.

Linear argues that the district court erred in granting summary judgment that Maxim had not contributed to or induced its customers' infringement of claim 51, by ignoring record evidence indicating Maxim's indirect infringement. Linear points to Maxim's parts data sheets, items on Maxim's webpage, an article published in a leading industry journal by Maxim, and an opinion by Maxim's counsel to argue it presented evidence that Maxim's customers used the current reversal feature of Maxim's accused parts.

Maxim responds that summary judgment was properly granted because Maxim's products do not

prevent the reversal of the average inductor current, as required by the district court's construction of claim 51. Maxim states that its products are not designed or intended for uses where average inductor current reversal is possible. It argues that the Maxim documents to which Linear cites at most address preventing instantaneous inductor current reversal. Maxim thus contends that Linear failed in its burden to establish Maxim's contributory infringement or inducement of claim 51.

Summary judgment is appropriate "if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56 (c). Because Linear bears the burden of establishing infringement at trial, in moving for summary judgment Maxim need only establish a deficiency concerning an element of Linear's infringement claim. Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986) ("[T]he plain language of Rule 56(c) mandates the entry of summary judgment, after adequate time for discovery and upon motion, against a party who fails to make a showing sufficient to establish the existence of an element essential to that party's case, and on which that party will bear the burden of proof at trial."). To survive Maxim's motion for summary judgment of no contributory infringement or inducement, Linear, as the non-moving party, must "designate specific facts showing that there is a genuine issue for trial." Id. at 324 (internal quotation marks omitted).

Although not directly infringing, a party may still be liable for inducement or contributory infringement of a method claim under 35 U.S.C. §§ 271(b), (c) if it sells infringing devices to customers who use them in a way that directly infringes the method claim. R.F. Del., Inc. v. Pac. Keystone Techs., Inc., 326 F.3d 1255, 1267 (Fed. Cir. 2003). "Liability for either active inducement of infringement or for contributory infringement is dependent upon the existence of direct infringement." Joy Techs., Inc. v. Flakt, Inc., 6 F.3d 770, 774 (Fed. Cir. 1993). There can be no inducement or contributory infringement without an underlying act of direct infringement. Id.

While the evidentiary showing in this case may be sparse and not altogether clear, we believe that Linear has satisfied its burden under Celotex by presenting specific facts showing that there is a

genuine issue for trial as to Maxim's contributory infringement or inducement of claim 51 of the '178 patent. See Celotex, 477 U.S. at 325. Linear's evidence establishes that Maxim products used at least in IBM computers may have circuitry that prevents reversal of inductor current. For example, Linear cites a document from Maxim's webpage that states in pertinent part:

Another MAX782 innovation—fast, precise current sensing—allows the device to turn off its synchronous-rectifier switch as the inductor's discharge current passes through zero. . . . Competitive chips either disable the synchronous rectifier completely at light loads, or leave it on and pay a big penalty in quiescent supply current. (With the rectifier on, the reversal of inductor current after discharge causes a transfer of energy from the output capacity back to the battery. . . .)

Appellant's Br. at 53 (quoting Joint Appx. at 14167) (emphases added). This document raises a factual issue whether Maxim's accused device turns the switching transistors off to prevent the current to the load from reversing polarity, as required by claim 51. Even if Linear's evidence only pertains to instantaneous inductor current, as Maxim contends, Linear persuasively argues that the "preventi[on] [of] instantaneous inductor current also prevents reversal of average inductor current." Appellant's Reply Br. at 24. In effect, Linear argues the prevention of instantaneous inductor current by definition prevents the average inductor current from reversing polarity. This may provide a basis for establishing that Maxim's devices can directly infringe the current reversal prevention claims of the '178 patent.

Linear also presented evidence that Maxim's customers directly infringe by using Maxim's parts to prevent current reversal. Disregarding the content of Blauschild's "RB I" expert declaration, which was excluded by the district court, the record nonetheless contains circumstantial evidence of direct infringement. For example, the record includes a letter from Maxim's customer, IBM, stating that: "the Thinkpads which use Maxim chips use the reverse current protection feature of those chips." Joint Appx. at 11226. This evidence, together with the Maxim webpage noted above, and other record evidence, provides sufficient support for Linear to survive summary judgment.

Because Linear's evidence raises a genuine issue as to Maxim's contributory infringement or inducement of claim 51 of the '178 patent, we vacate the district court's summary judgment of non-infringement.

C. Cross-Appeal

1. Inventorship

The parties dispute whether the district court correctly found that Ronald Vinsant's claim of joint inventorship of the '178 patent was not corroborated. Maxim argues that Vinsant developed the polarity reversing circuitry in 1989 while working at Teledyne and that after joining Linear, Vinsant shared his knowledge with the named inventor Wilcox. Maxim contends that Vinsant qualifies as a joint inventor and that Maxim cannot infringe because it has since purchased Teledyne's ownership interest. Maxim argues that Vinsant provided detailed "written and oral testimony" that he conceived the claimed polarity reversal prevention aspects and that the district court erred in finding no corroboration. Linear responds that the district court did not err because Vinsant failed to present a single contemporaneous document or witness from Teledyne to corroborate Vinsant's claim.

The district court found that Maxim failed to present contemporaneous corroborating documentation or witnesses describing Vinsant's conception at Teledyne. See Summary Judgment Order, slip op. at 62-63 ("Where are the diagrams, notes and letters that undoubtedly would have been produced contemporaneous with Vinsant's conception?"). The district court noted that Maxim's evidence was circumstantial and was "highly ambiguous" and "tangential at best." Id. at 62.

A party seeking correction of inventorship must provide clear and convincing evidence of inventorship. Hess, 106 F.3d at 979-80; Ethicon, Inc. v. U.S. Surgical Corp., 135 F.3d 1456, 1461 (Fed. Cir. 1998). To meet the clear and convincing evidentiary burden, the alleged co-inventors must prove their contribution to the conception with more than their own testimony concerning the relevant facts. Trovan, Ltd. v. Sokymat SA, 299 F.3d 1292, 1302 (Fed. Cir. 2002) (citing Price v. Symsek, 988 F.2d 1187, 1194 (Fed. Cir. 1993)). Whether the co-inventor's testimony has been sufficiently corroborated is evaluated under a "rule of reason analysis," which requires that an "evaluation of all pertinent evidence must be made so that a sound determination of the credibility of the inventor's story may be reached." Price, 988 F.2d at 1195. Corroborating evidence may take many forms. Reliable evidence of corroboration preferably comes in the form of records made contemporaneously with the inventive

process. Sandt Tech., Inc. v. Rosco Metal & Plastics Corp., 264 F.3d 1344, 1350-51 (Fed. Cir. 2001). Circumstantial evidence of an independent nature may also corroborate. Trovan, 299 F.3d at 1303. Additionally, oral testimony from someone other than the alleged inventor may corroborate. Id. Maxim cross appeals from the district court's grant of Linear's motion for summary judgment that Vinsant was not an inventor of the '178 patent. Summary judgment is properly granted if the evidence, when viewed in a light most favorable to the non-moving party, fails to establish the inventorship of an omitted inventor by clear and convincing evidence. See Teleflex, 299 F.3d at 1323.

In making its inventorship determination, the district court correctly set forth our inventorship precedent, including the need to evaluate the evidence of corroboration under a rule of reason analysis. See Summary Judgment Order, slip op. at 55-56. The court then thoroughly reviewed the evidence presented and concluded that no reasonable juror could find that Maxim had corroborated Vinsant's testimony that he invented the polarity reversing circuitry while at Teledyne. Id. at 63.

a. Reni Testimony and Exhibit D-136

Maxim presented testimony by Daniele Reni, an Apple employee who allegedly discussed regulator circuitry with Vinsant while he was at Teledyne. Maxim also relied on a circuit diagram from Reni's files, made by Vinsant and referred to at trial as D-136. Summary Judgment Order, slip op. at 57-58. It was undisputed that the D-136 diagram did not depict a complete synchronous switching regulator. From the partial circuitry shown in the D-136 diagram, the district court could not determine whether the transistor turns off at peak current or when the current approaches or crosses zero. Id. at 57. The district court observed that Reni's testimony did not shed light on what concepts were depicted in the D-136 diagram. Id. at 57-58. At best, the district court noted, Reni recalled that he discussed current reversal with Vinsant and they conducted brainstorming sessions about this issue. Id. at 58-59. The district court observed that it was unclear whether the current reversal to which Reni testified was "current reversal" within the meaning of the '178 patent claims. Id. at 59. Noting that Reni's testimony was at best "terse and cryptic," the court concluded that the testimony and D-136 diagram did almost nothing to corroborate Vinsant's claim of inventorship. Id.

Maxim argues that Reni's testimony and the D-136 diagram together corroborate Vinsant's inventorship claim. Maxim contends that whether the circuit in the D-136 diagram turned off at peak or near-zero current was a fact dispute to be resolved by a jury. Further, Maxim argues that Reni's testimony about "current reversal" described the concept claimed in the '178 patent.

After reviewing the district court's analysis, we find no error in the district court's reasoning or conclusion. The district court correctly observed that Maxim failed to establish that either the circuitry depicted in the D-136 diagram or the current reversal concepts Reni testified that he discussed with Vinsant depicted or explained "current reversal" within the meaning of the '178 patent claims. At best, Maxim urges us to re-weigh Reni's testimony and the D-136 diagram to infer that they represent details sufficient to corroborate Vinsant's inventorship claim. Maxim thus fails to establish a dispute of material fact that either Reni's testimony or the D-136 diagram corroborated Vinsant's inventorship of a regulator within the scope of the '178 patent claims.

b. Notebook Diagram

Maxim also introduced a diagram in a Linear lab notebook labeled "Ron Vinsant's Laptop Switcher Proposal" dated February 21, 1991 ("notebook diagram"). Summary Judgment Order, slip op. at 59-60. The district court concluded that, even assuming the notebook diagram depicted a circuit within the scope of the '178 patent claims, the notebook diagram would still fail to corroborate Vinsant's claim that he conceived of current reversal circuitry at Teledyne. Id. at 60. The court noted that at best, the notebook diagram could only establish Vinsant's conception at Linear, id., after he left the employ of Teledyne. Maxim argues that the notebook diagram "lends great credibility" to Vinsant's testimony that he explained approaches he had previously used at Teledyne to the named inventor Wilcox at Linear. Cross-Appellant's Br. at 65.

The district court's conclusion was based on sound facts and analysis. The notebook diagram is inconclusive of what circuitry Vinsant may have developed while at Teledyne, and thus fails to corroborate Vinsant's claim. The notebook diagram only documents the current reversal circuitry Vinsant discussed at Linear, and not what circuitry Vinsant may have previously developed at

Teledyne. Again, Maxim fails to establish an error in the district court's conclusion that the notebook diagram could only corroborate Vinsant's alleged conception at Linear.

c. Vinsant's Drawing for Counsel

Maxim presented to the district court a circuit diagram Vinsant produced in 1998 when he met with Maxim's counsel. Summary Judgment Order, slip op. at 57. The district court did not explicitly analyze this evidence in its opinion.

Maxim argues that a circuit diagram Vinsant produced when he met with Maxim's counsel contains elements of the current reversal claims, even though Vinsant never reviewed the '178 patent. Maxim argues that because this drawing is simply a "more detailed version" of the contemporaneous D-136 and notebook diagrams, it supports Vinsant's account. Cross-Appellant's Br. at 65-66. Linear responds that this drawing was litigation-inspired, Vinsant was shown the '178 patent by defense counsel, and Vinsant had heard defense counsel's characterizations of the patent.

We have previously held that the most reliable corroborating evidence are "records made contemporaneously with the inventive process." Sandt Tech., 264 F.3d at 1350-51. Because this record was made in 1998, many years after Vinsant allegedly conceived of the current reversal circuitry at Teledyne, it is of questionable value as corroboration for Vinsant's claim of conception during his employment at Teledyne. We find no error in the district court's failure to discuss this diagram.

Because the district court, after viewing the evidence in a light favorable to Maxim, correctly concluded that no reasonable juror could find that Vinsant's inventorship claim was corroborated, we affirm the district court's grant of summary judgment that Vinsant was not an inventor of the '178 patent.

III. CONCLUSION

Because the district court erred in construing the "circuit," "vary the duty cycle," and "simultaneously off" claim limitations of the '178 patent, we vacate the judgment of non-infringement

and remand for further consideration. We further vacate the district court's summary judgment of no contributory infringement or inducement of the current reversal method claims of the '178 patent, because genuine issues of material fact have been raised concerning Maxim's contributory infringement or inducement. As to Maxim's cross-appeal, because the district court did not err in granting summary judgment that Vinsant was not a joint inventor of the '178 patent, we affirm.

VACATED-IN-PART, AFFIRMED-IN-PART, AND REMANDED.

IV. COSTS

No costs.